

**Testimony of  
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**To**

**U.S. House Committee on Science and Technology  
Subcommittee on Energy and Environment  
New Roadmaps for Wind and Solar Research and Development  
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Chairman Baird, Ranking Member Inglis and distinguished members of the Committee and staff, thank you for the opportunity to testify today. I am a Board Member of the Solar Energy Industries Association (SEIA), and a Senior Advisor for United Solar Ovonic and its Parent, Energy Conversion Devices (“ECD”), a publicly traded manufacturer of thin-film solar laminates based in Rochester Hills, Michigan - near Detroit.

ECD’s largest business unit is its wholly owned subsidiary, United Solar Ovonic. United Solar is a global leader in manufacturing thin-film solar photovoltaic (PV) laminates that convert sunlight into clean, renewable electricity under the *UNI-SOLAR*<sup>®</sup> brand name.

Because of their unique properties (flexibility, durability, light weight), *UNI-SOLAR* laminates are ideal for rooftop and other building-integrated applications. While we sell products for many applications, most of our solar laminates are installed on rooftops. In fact, our products were used to build the world’s largest rooftop solar photovoltaic installation: a 12 Megawatt solar array on the roof of an automobile production plant in Zaragoza, Spain. *UNI-SOLAR* also powers some of the largest installations here in the United States, including a 2 Megawatt installation on the roof of a supermarket distribution center in Southern California.

To make our *UNI-SOLAR* laminates, we employ more than 2,000 people, with most of those employed in Michigan. We operate two manufacturing facilities in Auburn Hills, Michigan, two manufacturing facilities in Greenville, Michigan - a town in desperate need of jobs after the Electrolux manufacturing plant shut down and we are constructing a fifth plant in Battle Creek Michigan. We are one of the few US manufacturers of solar cells and modules.

Our global research and development efforts are also headquartered in Troy, Michigan. Since 2006, United Solar has increased its Michigan employee base four-fold. In fact, according to the Energy Information Administration (EIA), Michigan is the second largest producer of solar cells and modules among all 50 states<sup>1</sup>, primarily because of us.

We applaud the subcommittee’s commitment to solar energy and support of the Department of Energy’s (DOE) solar research program. We also believe that a government/industry partnership to develop a Solar Power road map/Solar Vision to guide the US research, development, demonstration and commercial application efforts would be of great value. Such a program, properly funded would address the national priorities of effectively addressing climate change, enhance US competitiveness and energy security, revitalize our manufacturing base and create “green collar” jobs by investing in programs that decrease our dependence on foreign oil and address global climate change.

A great example of government/industry partnership is DOE’s Solar America Initiative (SAI) program. Unlike previous programs that emphasized only on certain aspects of system cost, SAI focuses on achievement of c/kWh to reach grid parity. Many industries are participating in this program that has already led to significant cost reduction. We have developed new technology under this program that, when introduced in our manufacturing, will accelerate our progress to achieve grid parity

We are interested in participating in further development in road mapping process for solar electricity and believe that larger investment and coordination are important for accelerating the widespread adoption of solar energy production. We are competing against countries not companies. Bell labs invented photovoltaics 54 years ago, less than a decade ago we had 40% of the worlds PV manufacturing capacity here in the US, but today it is only about 8%.

We need to put the Nation's engineering, scientific and innovation talents to work to bring down the cost of solar power and revitalize our manufacturing base. But as I will discuss in more detail later, we also need to create a robust market here at home for our products. Today we at United Solar export 80% of our products.

Other countries with visionary policies and investments are creating thousands of green jobs. Germany is the largest PV market in the world. Its programs and policies have lead to huge numbers of new jobs both on the manufacturing side and on deployment side, creating jobs for not only companies that manufacture PV cells and modules but also for electricians, roofers, balance of systems providers who install the PV modules. Today Germany, home of BMW and Mercedes has more people employed in renewable energy than in the automotive business.

A road map and federal support is an excellent vehicle to help achieve the Subcommittees and the Administrations goals. We believe we can play an important role in making this happen, but no solar company is large enough to bear the financial burden of doing research all along the supply chain in an efficient manner. There are areas where collaboration makes sense and we and others in the industry support working with academia, national labs and each other.

DOE in coordination with other agencies of the federal government and Industry can play an important role as a neutral party that can facilitate communication and support along the research, development and commercialization path to reduce the costs of solar systems and help advance solar photovoltaic technology and processes to make domestically manufactured solar systems accessible and affordable across the country.

While addressing the supply side is critical; we also need as a Nation to address the demand side. In particular, we believe the government should lead by example and install PV on roofs of federal buildings and encourage States to do the same. Before offering some specific suggestions, I would like to highlight the benefits of using solar photovoltaic technology for distributed generation to put some of my recommendations in context.

### **Distributed Generation from Solar Photovoltaics**

Stated simply, distributed generation is when electricity is generated at the point of use. Today, nearly all of our electricity comes from big, centralized power plants—mostly coal, natural gas and nuclear plants—that depend on an inefficient electricity grid to get power to users.

These centralized power plants are generally located in isolated areas away from densely populated areas, which means that the power must be transmitted over great distances to population centers where it is consumed. This additional infrastructure, known generally as our

electrical grid, is antiquated, inefficient, and entirely inadequate to support our growing national demand for energy. One study estimated that 6-8% of the electricity generated in power plants is lost through today's transmission and distribution system.<sup>2</sup> Many renewable power plants are also located far from population centers. Many utility-scale solar plants are located in sparsely populated desert regions, where land is cheap. Wind farms are obviously built in windy areas, or even offshore. These large-scale solar and wind fields also take up vast acreage. In other words, much of the renewable energy generated today is actually piped right back into the same electrical grid, and subject to the same inefficiencies, limitations and delivery costs.

Distributed Generation solves the infrastructure problem because the power is produced at the point of consumption and solar photovoltaic technology is the cleanest and best suited means of democratizing power production. For most buildings, the roof has no other purpose than to cover what lies beneath it. Solar material is infinitely scalable and has the advantage of producing most of its power when electricity from the grid is in highest demand and most expensive, saving solar energy users' money.

The benefits of distributed generation are numerous, and the Federal Government can harness these benefits by purchasing PV systems directly or via power purchase agreements and installing thousands of rooftop solar systems on government facilities, businesses and homes across the country. A large-scale rooftop solar distributed generation program will help our nation become more energy efficient, less dependent on foreign fuels, reduce the emissions of CO<sub>2</sub> thereby improving our environment, and create hundreds of thousands of new "green jobs" here at home.

Commercial property owners are already harnessing the benefits of solar PV for Distributed Generation. In fact, commercial property owners purchased roughly half of all domestic solar cell and module shipments in 2007.<sup>3</sup> Commercial property owners understand the value of real estate, and were early supporters of rooftop solar installations since they could maximize the financial return of existing buildings while also saving money on their electricity bills.

### **Benefits of Using Solar for Distributed Generation**

- Is available immediately. Traditional power plants take years, even decades, to secure approval, design and construct. Solar rooftop installations can be designed and installed in a matter of months, or even less for smaller systems. And the solar industry in the United States already has enough production capacity to meet existing domestic demand, as well as any new government procurement programs. We are also in a position to accelerate our expansion plans if the government adopts a robust procurement plan for solar rooftop installations.
- Creates new "green" jobs across the country. Production and installation of solar energy systems creates more high-quality jobs than investment in any other energy technology.<sup>4</sup> According to SEIA, ten megawatts of PV capacity (enough to power 1,500 homes) creates as many as 140 manufacturing jobs, 100 installation jobs, and 3 ongoing operation and maintenance jobs. These jobs will re-employ workers in hard-hit industries.

- A federal program to install solar power on millions of rooftops would create hundreds of thousands of new jobs in the design, production and installation of solar PV systems. Distributed power is produced locally, so the design and installation jobs are created here in the USA. This job creation will immediately stimulate the economy, and will create sustainable “green collar” jobs for the industries of the twenty-first century and establish the United States as a leader in this sector. That is why it is important for you to insist on U.S. manufacturing for all federal PV solutions. With a requirement of U.S. manufacturing for federal procurement of solar systems, high-quality jobs can be retained and created not only for PV manufacturers like our company, United Solar , but also for electricians, installers, other balance of systems manufacturers as well as for constructing manufacturing facilities and building PV manufacturing equipment.
- Reduces CO<sub>2</sub> emissions. Solar energy is clean, renewable, and free. The more electricity we generate from solar power, the less we need to burn fossil fuels like coal, oil or natural gas. Solar power is acknowledged as one of the leading technologies to quickly begin carbon mitigation. According to SEIA, one megawatt of PV will displace 1,200 tons of CO<sub>2</sub> from traditional electricity generation each year it is in service, and modern solar PV systems typically last 20-25 years.
- Optimizes land utilization. Densely populated areas face the challenge of needing more power generation, while also facing high land values. Rooftop solar arrays do not use land that may have higher and better uses, but instead take advantage of unused space to produce power right where it is most needed.
- Reduces strain on antiquated electrical grid. The average output period of a solar system over the course of a normal day matches the average U.S. daily demand cycle. Therefore, distributed solar power can help relieve the strain on the existing electricity grid when demand is highest.
- Saves capital by avoiding infrastructure construction. As this Committee well knows, the existing transmission and distribution system for our nation’s electrical grid is at the breaking point. Distributed Generation reduces the need for additional transmission lines, since the power is consumed at the point of production. Additionally, any leftover power can be sold back into the local community. And since rooftop solar generation takes advantage of otherwise unused space, there is no wasted land.
- Provides strategic backup in case of grid interruption. One of the benefits of distributed generation is to have a source of back-up power in case of outages. Solar systems have a limitless fuel source (the sun), which means they can be configured to extend the uptime of any facility that loses its supply of grid electricity.
- Improved Air Quality. Because rooftop PV systems produce the most power when demand is highest, they reduce the need to turn on additional electric power plants, which are usually the dirty peaker plants thatacerbate air pollution on hot summer days.

- No Water Consumption. Distributed solar systems do not require any fresh water for electricity generation, an especially important issue where solar resources are greatest, the American Southwest.

## **What the Federal Government Should Do**

### **Research, development, analysis and demonstration**

- Properly fund the programs to achieve grid parity.
- Ensure that all costs are considered in the development of a solar road map and recommending priorities.
  - ❖ Focus should be on lowest cost per kilowatt hour taking into consideration the installed cost of the system per watt and amount of electricity generated per year. Focus should be on performance of PV under real life conditions, not on efficiency measured in the laboratory.
  - ❖ In comparing costs with convention power plants benefits of solar during peak demand should be taken into account.
  - ❖ Energy payback i.e. the time required to produce the energy required to manufacture the products should be taken into consideration in evaluating technologies and costs.
  - ❖ Consideration should be given to land use, need for new transmission and distribution (T&D) infrastructure, and T&D losses from centralized facilities vs. distributed generation.
  - ❖ Cost of disposal of PV products should also be studied including evaluation of the costs of disposal of toxic materials.
  - ❖ .Health benefits and security benefits should also be taken into consideration
- Funding priorities and demonstration.
  - ❖ Continuation of programs like SAI with focus on c/kWh should be a priority.
  - ❖ Funding of a robust initiative to develop advanced manufacturing technology will be critical for the US to help revitalize the US manufacturing base and regain the US leadership in this important field.
  - ❖ The programs should focus on development of new technologies such as thin-films rather than established crystalline based technologies.
  - ❖ Consider demonstrations greater than 2 MW and projects that demonstrate roof top solar when possible – to demonstrate advantages of no land use, no T&D losses, immediately available – no long permitting required, greater energy security and cyber security benefits.
  - ❖ Funding should also be provided for pilot manufacturing plants to demonstrate new manufacturing technologies.
  - ❖ Demonstrations funded with tax payer funding must use PV modules manufactured here in the US.

- ❖ Provisions should be considered that would insure technology that is developed with tax payer money is implemented here in the US i.e. production plants employing advanced manufacturing technology funded by tax payers should be located in the US.
- Timing
  - ❖ The programs should be aggressive and interim targets should be established.
- Competitiveness
  - ❖ Incentives and programs should be bench marked with incentives, programs, job creation and competitiveness of other countries.
- Interagency coordination
  - ❖ Critical to the success of the programs will be interagency coordination in both development and deployment.

## Deployment

The Federal Government is the country's largest single consumer of electricity, spending over \$ 6 Billion annually. Therefore, in addition to having the regulatory authority to make the U.S. solar industry the envy of the world, the Federal Government also has the unique opportunity to lead by example. Federal support of rooftop solar photovoltaics will significantly advance the nation's commitment to renewable energy, and can be executed rapidly enough to have a significant positive near-term impact on our struggling economy. Below are the suggested priorities that we believe the government should enact.

- Install rooftop solar systems on Federal buildings. The U.S. General Services Administration (GSA) owns and manages 8,600 buildings in 2,200 communities across the country.<sup>5</sup> The Departments of Energy and Defense have already taken the initiative by installing solar systems on rooftops. By enhancing and expanding the government's commitment to rooftop solar into a robust, multi-year procurement program, the government can dramatically advance the entire U.S. solar photovoltaic industry. The results of this kind of national procurement program via direct purchase or power purchase agreements would include significant job creation, reduced manufacturing costs for solar systems through economies of scale, and the development of a vibrant installation industry in areas of the country where it does not yet thrive, as well as the national economic and strategic goal of reduced reliance on foreign fuels.
- Integrate the government effort. Regardless of where the money is put in the budget, the nation needs to take advantage of the needs and enthusiasm of the Department of Defense (DOD) to increase solar power use. The DOD owns more buildings than the rest of the government. Many are large buildings. Imagine every military aircraft hangar in the Sunbelt covered with solar systems. DOD has an aggressive energy program for its installations and is very interested in photovoltaic power production. However, the DOD effort needs to be

coordinated with other government efforts. DOD facilities would be a great place to start. They could produce power, as well as allow utility companies to benefit from free or low-cost roof space in exchange for long-term power purchase agreements giving DOD predictable power bills. This would make these precious facilities even more valuable and treasured by their communities. Instead of individual projects, a large-scale integrated effort with DOD facilities could quickly transform the whole industry.

- Encourage the use of domestically manufactured components. In addition to creating new jobs in the design and installation of systems, the government should support a “Made in the USA” plan to encourage solar cell and module component manufacturers to build new factories here and hire U.S. workers. With a robust PV government procurement program that includes a “Made in the USA” requirement we and others in the industry will accelerate plans to meet the increasing demand for solar PV products. Continued development of solar PV technology in the U.S. will make our industry the world leader.
- Provide additional incentives for rooftop and building-integrated solar installations. France, Italy and Spain are trying to encourage *rooftop* solar installations today. They have created enormous interest in rooftop solar by offering higher incentives for rooftop and building-integrated installations over ground-mount installations. These countries understand that rooftop systems do not require land, nor do they suffer from transmission and distribution losses. Adopting similar incentive programs would multiply the effectiveness of the solar Investment Tax Credit (ITC) that took effect at the beginning of the year.
- Encourage flexible rules. More forward looking analysis is needed to optimize both the best technology and the best use of rooftops. Rules on contracting, land use, and entering into long-term power purchase agreements need overhauling to generate the needed flexibility, and financial returns, to motivate power companies and government facilities into cooperative action. The evolving market needs more flexible rules. Payback periods, for example, will be better when conventional power prices rise and PV system costs continue to decline.
- Provide funding for states and local governments. All levels of government should be encouraged to install solar photovoltaic systems on the rooftops of their buildings. Offices, schools, universities, courthouses, and hospitals are excellent sites for clean, made in the USA, rooftop solar PV systems.  
Implement programs on a timely basis. We need to insure that programs that are adopted are implemented in an expeditious fashion. ARRA included a number of provisions that would be very beneficial to the solar industry and achievement of the Administrations goals, but regrettably most of the programs have not yet been implemented.

We applaud the Committee for its commitment to lead the green revolution. I hope my testimony today has been helpful, and I would be happy to answer any questions you may have. I look forward to continuing to work with the Committee and its staff on ensuring that the U.S. is once again a world leader in solar photovoltaics, while also reviving our economy and putting our fellow Americans back to work. **Thank You.**

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<sup>1</sup> Energy Information Administration: *Shipments of Photovoltaic Cell and Modules by Origin, 2006 and 2007*; [http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/table3\\_5.html](http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/table3_5.html)

<sup>2</sup> ABB Inc.: *Energy Efficiency in the Power Grid*, 2007; [http://www04.abb.com/global/seitp/seitp202.nsf/c71c66c1f02e6575c125711f004660e6/64cee3203250d1b7c12572c8003b2b48/\\$FILE/Energy%20efficiency%20in%20the%20power%20grid.pdf](http://www04.abb.com/global/seitp/seitp202.nsf/c71c66c1f02e6575c125711f004660e6/64cee3203250d1b7c12572c8003b2b48/$FILE/Energy%20efficiency%20in%20the%20power%20grid.pdf)

<sup>3</sup> Energy Information Administration: *Domestic Shipments of Photovoltaic Cells and Modules by Market Sector, End Use and Type, 2006 and 2007*; [http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/table3\\_7.html](http://www.eia.doe.gov/cneaf/solar.renewables/page/solarreport/table3_7.html)

<sup>4</sup> Apollo Alliance and Urban Habitat, "Community Jobs in the Green Economy," 2007

<sup>5</sup> General Services Administration, Properties Overview; [http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA\\_OVERVIEW&contentId=8513](http://www.gsa.gov/Portal/gsa/ep/contentView.do?contentType=GSA_OVERVIEW&contentId=8513)